EGG measurement under various situations

Masatomo Inoue[1], Shingo Iwamura[1], Masaki Yoshida[2]

[1]Graduate School of Engineering, Osaka Electro-Communication University, Neyagawa, Japan

[2]Osaka Electro-Communication University, Neyagawa, Japan

Abstract-**As a result of the experiment directly guided from a gastric membrane side or gastric tunica serosa ventriculi side, electric activity of the stomach is generated at 3 cycle per minutes (3cpm) from the pacemaker near the greater curvature of stomach side in the stomach upper part 1/3, and being spread to a pylorus side is confirmed. This is called of Electrical Control Activity (ECA) or slow wave. However, in the general clinical place, it is very difficult to record the electric activity from a gastric membrane side or gastric tunica serosa ventriculi, and the clinical application is restricted. On the other hand the method of recording electric activity of the stomach accompanied by stomach movement from the abdominal walls is called Electrogastrography (EGG), and we can record it now comparatively easily by progress of technology in recent years. Then, we performed EGG measurement under various situations. Consequently, we discovered whether stress has a certain influence on the stomach activities.**

***Keywords*- EGG, 3cpm**

I. INTRODUCTION

EGG is established by progress of a technical side as one of the methods of inspecting for studying the state of the stomach in various situations. However, when we apply to general clinical using and judging the EGG record for every situation has been the index suitable for judging a gastric state of some analysis indices not to establish. Then, our purpose is measure the state of the stomach in various situations and establishing a suitable index.

This time, we developed the measurement system, in order to enable measurement under various situations.

And we performed EGG measurement under the various situations at the time of meal load and stress load, and examined the record waveform.

II. METHODOLOGY

1, *Measurement system*

We measured the gastric electric signal using Ag-AgCl electrode. We used the secondary band path filter that is 0.030Hz - 1.026Hz. Gain is 600. The power supply voltage is 18V. And we stored the data to carried type data logger with a sampling rate of 2Hz.

2, *Measuring method*

The subject is a 20 years old healthy man. We determined by experiment which position was the best location for EGG recording because the gastric position is various by the subject. As a result, we determined that we equip with electrode two points with an interval that crosses 3/4 on the line that connects a navel to a sword-like projection right-angled of 10cm. We show the electrode position in Fig. 1.

Then, we measured EGG under following conditions.

1) *At the time of food load*

The subject sat on the chair and ate 200g of rice, sitting down, after 12 hours fasting.

2) *At the time of physical stress load*

The subject sat on the chair and soaked both legs into iced water up to his knees for 10 seconds duration, then the subject removed his legs and rested 1 minutes, repeated 12 times, after the 12 hours fasting.

3) *At the time of mental stress load*

The subject sat on the chair and drove a car for 30 minutes, after the 12 hours fasting.

3, *Analysis method*

We carried out frequency analysis of each EGG by the FFT method. Time length was 128 seconds in every 2 minutes.

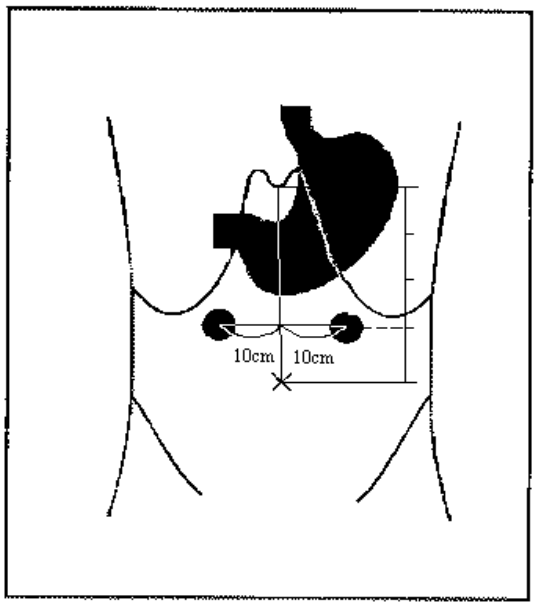

Fig.1. Electrode position

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Abstract

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III. RESULTS

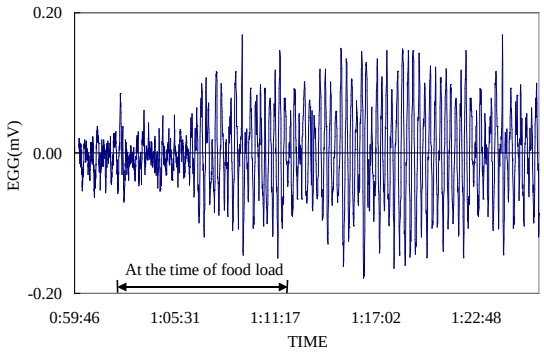

fig.2. EGG of food load

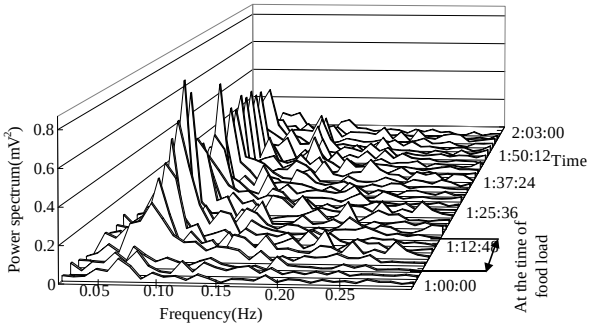

Fig.3. Power spectrum of EGG during eating

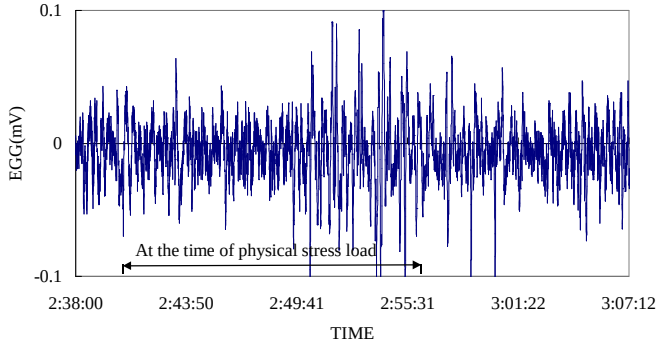

Fig.4. EGG of physical stress load

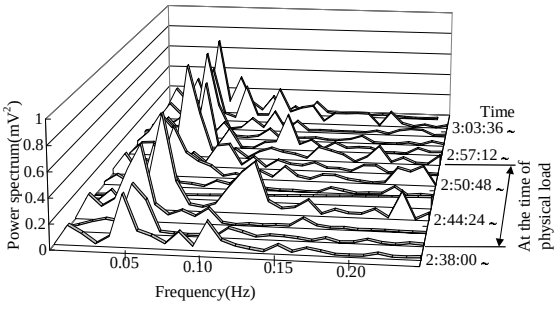

Fig.5. Power spectrum of EGG during physical stress

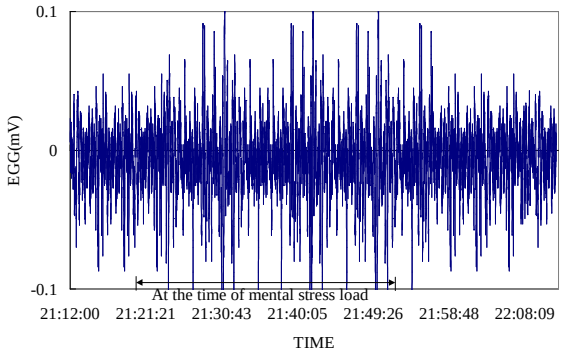

Fig.6. EGG of mental stress load

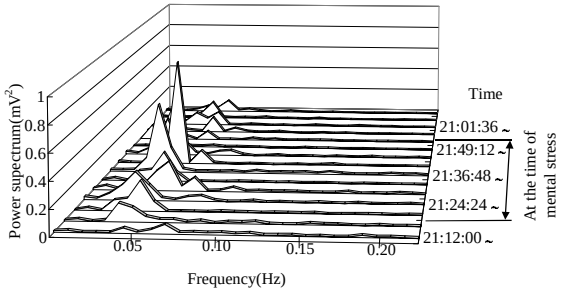

Fig.7. Power spectrum of EGG during mental stress

During the food load measurement, About 4 minutes after the subject started to eat, the amplitude of EGG became larger than the time of rest, and the amplitude of a power spectrum became gradually large. This is considered that the gastric peristalsis became active as compared with the stomach at time of quiet. Moreover, about 25 minutes after the subject ended to eat, the amplitude of EGG became gradually small and the amplitude of a power spectrum became gradually small. It is thought that activity of a peristalsis of that as which this has not finished digestion of a gastric contents thing completely decreased. The peak frequency of EGG shows near 0.05Hz at all the times. It is thought that this was the regular stomach movement. In the experiment of physical stress load, immediately after the subject soaked legs into iced water, the amplitude of EGG didn't change, compared with the time of quiet. However, the power spectrum became larger than the time of rest. The subject soaked legs into iced water, about 10 minutes after, the amplitude and the power spectrum of EGG became clearly larger than the time of rest. Moreover, the peak frequency ingredient of EGG varied from 0.04 to 0.10Hz. It is thought that the stomach requires clearly irregular movement compared with the time of quiet and food load, and it is thought that the stomach feels a certain stress.

In the experiment of mental stress load, while the subject drove the car, the amplitude of EGG became large immediately. It is thought that this is what is depended on gastric strain. After that, the amplitude of EGG became

large and small, and we can say the same thing also about a power spectrum. Moreover, peak frequency of EGG varies between 0.04Hz and 0.07Hz. It is thought that this has an irregular motion of the stomach.

IV. Discussion

As a result of EGG measurement, when the load of food was given to the stomach, it turns out that the stomach acts regularly and actively. We experimented in food load several time, the same tendency was seen in every experiment. Moreover, it changes appear in gastric electrical activity when mental or physical stress was applied to the stomach. However, even if we experimented with the same stress load, we were unable to get the same result every time. From the above results, we are measuring EGG and can presume a motion of the stomach by food load. However, as for an index when stress load is given to the stomach, we likely to have room to solve still more

V. Conclusion

In the future, we will be expected to locate the source of frequencies other than the 0.05Hz that can be checked when carrying out frequency analysis of the EGG. Moreover, we need to evaluate the relation between stress and the stomach by performing measurement that was parallel in an electrocardiogram, hart rate, and EGG. At present, the extreme sensitivity of the EGG measuring system limits the applications. If this is improved and the stress emission situation of a subject running or moving can be measured, the equipment to measure such stress will be built in the future.